Claims

1. An oscillation circuit comprising:

a first voltage-controlled oscillator having a resonance circuit including at least one variable capacitance element;

a second voltage-controlled oscillator having a resonance circuit including at least one variable capacitance element;

a first buffer amplifier for feeding-back a high frequency signal generated from the first voltage-controlled oscillator to the second voltage-controlled oscillator; and

a second buffer amplifier for feeding-back a high frequency signal generated from the second voltage-controlled oscillator to the first voltage-controlled oscillator;

wherein said first and second voltage-controlled oscillators generate output high frequency signals having a same frequency and a mutual phase difference of 90 degrees, and said same frequency of the output high frequency signals is controlled by adjusting a control voltage applied to said variable capacitance elements provided in the resonance circuits of the first and second voltage-controlled oscillators.

2. The oscillation circuit according to claim 1, wherein currents flowing from said first and second voltage-controlled oscillators and currents flowing from said first and second buffer amplifiers are fixed to such values that desired phase noise is obtained.

3. The oscillation circuit according to claim 1, wherein each of said resonance circuits of the first and second voltage-controlled oscillators is formed by a quasi-LC resonance circuit includes at least one inductive element in addition to said at least one variable capacitive element.

4. The oscillation circuit according to claim 1, wherein each of said resonance circuits of the first and second voltage-controlled oscillators is formed by a quasi-RC resonance circuit includes at least one resistive element in addition to said at least one variable capacitive element.

5. The oscillation circuit according to claim 3, wherein each of said plurality of voltage-controlled oscillators comprises first and second transistors having cross coupled bases and collectors and commonly connected emitters, a pair of variable capacitance elements connected across the collectors of the first and

second transistors, a pair of coils connected between the collectors of the first and second transistors, a control terminal connected to a common junction point of said pair of variable capacitance elements, a power supply terminal connected to a common junction point of said pair of coils, and first and second output terminals connected to the collectors of said first and second transistors, respectively, and each of said plurality of buffer amplifiers comprises third and fourth transistors having commonly connected emitters, whereby said control voltage is applied to said control terminal, and said first and second output terminals generate said output high frequency signal in non-inverted and inverted fashions, respectively.

6. The oscillation circuit according to claim 5, wherein said commonly connected emitters of said first and second transistors are connected to a reference potential via a series circuit of an emitter-collector path of a fifth transistor, said commonly connected emitters of the third and fourth transistors are connected to the reference potential via a series circuit of an emitter-collector path of a sixth transistor and a resistor, and bases of said fifth and sixth transistors are connected a bias voltage source having a given value.

7. The oscillation circuit according to claim 5, wherein capacitors are connected between the cross coupled bases and collectors of the first and second transistors, and common junction points between the capacitors and the bases of the first and second transistors are connected to a bias circuit via respective resistors.

8. The oscillation circuit according to claim 1, wherein said variable capacitance element is formed by a varactor diode.

9. The oscillation circuit according to claim 8, wherein each of the resonance circuits of the first and second voltage-controlled oscillators comprises a pair of varactor diodes connected in opposite polarity, and commonly connected anodes or cathodes of said pair of varactor diodes are connected to a control terminal to which said control voltage is applied.

10. The oscillation circuit according to claim 1, wherein said first and second voltage-controlled oscillators and first and second buffer amplifiers are integrated into a single semiconductor chip.

11. An oscillation circuit comprising:

a plurality of voltage-controlled oscillators each having a resonance circuit including at least one variable capacitance element; and

a plurality of buffer amplifier whose number is identical with said plurality of voltage-controlled oscillators, said plurality of voltage-controlled oscillators and said plurality of buffer amplifiers being alternately connected into a ring-shape such that each of said plurality of buffer amplifiers feeds-back a high frequency signal generated from a succeeding voltage-controlled oscillator to a following voltage-controlled oscillator;

wherein said plurality of voltage-controlled oscillators generate the output high frequency signals having a same frequency and a desired mutual phase difference, and said same frequency of the output high frequency signals is controlled by adjusting a control voltage applied to said variable capacitance elements provided in the resonance circuits of said plurality of voltage-controlled oscillators.

12. The oscillation circuit according to claim 11, wherein currents flowing from said plurality of voltage-controlled oscillators and currents flowing from said plurality of buffer amplifiers are fixed to such values that desired phase noise is obtained.

13. The oscillation circuit according to claim 11, wherein each of the resonance circuits of said plurality of voltage-controlled oscillators is formed by a quasi-LC resonance circuit includes at least one inductive element in addition to said at least one variable capacitive element.

14. The oscillation circuit according to claim 11, wherein each of said resonance circuits of the first and second voltage-controlled oscillators is formed by a quasi-RC resonance circuit includes at least one resistive element in addition to said at least one variable capacitive element.

15. The oscillation circuit according to claim 13, wherein each of said plurality of voltage-controlled oscillators comprises first and second transistors having cross coupled bases and collectors and commonly connected emitters, a pair of variable capacitance elements connected across the collectors of the first and second transistors, a pair of coils connected between the collectors of the first and second transistors, a control terminal connected to a common junction point of said pair of variable capacitance elements, a power supply terminal connected to a common junction point of said pair of coils, and first and second output terminals connected to the collectors of said first and second transistors, respectively, and each of said plurality of buffer amplifiers comprises third and fourth transistors having

commonly connected emitters, whereby said control voltage is applied to said control terminal, and said first and second output terminals generate said output high frequency signal in non-inverted and inverted fashions, respectively.

16. The oscillation circuit according to claim 15, wherein said commonly connected emitters of said first and second transistors are connected to a reference potential via a series circuit of an emitter-collector path of a fifth transistor, said commonly connected emitters of the third and fourth transistors are connected to the reference potential via a series circuit of an emitter-collector path of a sixth transistor and a resistor, and bases of said fifth and sixth transistors are connected a bias voltage source having a given value.

17. The oscillation circuit according to claim 15, wherein a pair of capacitors are connected between the cross coupled bases and collectors of the first and second transistors, and common junction points between the respective capacitors and the bases of the first and second transistors are connected to a bias circuit via respective resistors.

18. The oscillation circuit according to claim 11, wherein said variable capacitance element is formed by a varactor diode.

19. The oscillation circuit according to claim 18, wherein each of the resonance circuits of said plurality of voltage-controlled oscillators comprises a pair of varactor diodes connected in opposite polarity, and commonly connected anodes or cathodes of said pair of varactor diodes are connected to a control terminal to which said control voltage is applied.

20. The oscillation circuit according to claim 11, wherein said plurality of voltage-controlled oscillators and said plurality of buffer amplifiers are integrated into a single semiconductor chip.